

these data, it results that the duration of one oscillation should be 47.45 minutes, as computed by the formula  $T = \frac{2L}{\sqrt{gh}}$  where

$L$  is the length,  $h$  is the depth, and  $g$  the force of gravity, = 9.80596 meters. On the other hand, the arms at the southern end of the lake are not likely to take active part in the oscillation of the general mass, and Dr. Valentin thinks it more proper that we should omit their consideration, and adopt 165.6 meters as the mean depth of the remaining portion of the lake, whereby the computed period of oscillation becomes 43.01 minutes. Besides these simple or uninodal oscillations there are also observed binodal and even polynodal oscillations. The former are rather longer than one half of the principle oscillation, so that in general 19 binodal periods are synchronous with 10 uninodal, whence each one has a duration of 22.6 minutes. Oscillations of about 30 minutes and 15 minutes duration, that is to say two-thirds and one-third of the principle oscillation, sometimes occur in connection with the longer or single oscillation. At the north end of the lake, the 30-minute seiche combines with the 43-minute seiche after a short time, while at the south end of the lake the uninodal seiche is maintained pure and simple. The 15-minute seiche, as well as the 30-minute, undoubtedly originates in attempts at oscillations perpendicular to the axis of the lake. In general, the oscillations in the surface of Lake Garda show not only periods that are multiples of the principle seiche, but also the first and second octaves and the two-thirds and one-third of the fundamental period corresponding to the first and second quint or fifth above the fundamental note in music. The analogy between the oscillations of lakes and of the tones of musical instruments is thus quite complete, since the fifth and upper fifth occur most frequently next after the octaves.

A record by the limnograph maintained by Valentin at Riva must be compared with the record of the Italian observers in the southern part of the lake before we can completely elucidate all the peculiarities of its oscillations. The result of the first four months of registration at Riva was sufficient to show that the average duration of the uninodal oscillations was 42.99 minutes, and the amplitude was on the average 20 or 30 millimeters, but had twice attained to 60 or 70 millimeters.

Dr. Valentin gives no suggestion as to the origin of these seiches, but it has been generally recognized that although sometimes due to earthquakes they are most frequently initiated by sudden blasts of wind or changes in barometric pressure.

#### COPIES OF PROFESSOR VERY'S MEMOIR ON ATMOSPHERIC RADIATION.

A memoir under the above title was published by the Weather Bureau as Bulletin G, serial number W. B. No. 221, Washington, 1900. There has recently been a call for a few copies of this bulletin, and, as the edition is entirely exhausted, the Editor would be glad to hear from any one who is willing to dispose of his copy.

#### EXTREMES OF TEMPERATURE AND PRESSURE IN MONTANA.

On November 18, Mr. C. W. Ling, Assistant Observer, Havre, Mont., reported:

The weather that has prevailed so far this month has produced record breakers both in the temperature and the atmospheric pressure for the month of November. The first and second days of the month were the *warmest* November days on record at this station for a period of twenty-four years. The high atmospheric pressure that prevailed on the 17th instant made an actual barometric reading of 28.09 inches and a reduced reading of 31.03 inches at 12 noon, which is the *highest* November reading on record here.

The minimum temperature this morning,  $-29^{\circ}$ , was, with but two exceptions, the *coldest* on record here for the second decade of November.

#### COMPUTATION OF THE ALTITUDE OF MOUNT WHITNEY.

(See page 524.)

Under date of January 11, 1904, Prof. Joseph N. LeConte, of the University of California, says:

The Lone Pine railroad station is on the main line of the Carson and Colorado Railroad, and is on the eastern side of Owens River, close to the base of the Inyo Range. The town of Lone Pine is on the western side of the valley and on the western side of the river also. The distance between the two points is about three miles, and the railroad station bears about north  $60^{\circ}$  east of the town. I visited the railroad station last September and spent some time with Mr. McGrath, the division superintendent. His memory of the altitude of the rail at the station, namely, 3658 feet, was afterward corroborated in a letter from him to me after consulting the records of the survey at Carson City, Nev. Mr. Henry Gannett gives the same number in his directory of altitudes, evidently obtained from the same source. This, however, is not the altitude of the point occupied by Professor Langley in his determination of the height of Mount Whitney. There has never, to my knowledge, been a line of levels run between the two places, and the only determination of the height of the town that I have ever found is the one given by Captain Wheeler, namely, 3810 feet; this, however, is barometric.

There is a "railroad tangent" at Lone Pine station over 20 miles long. It is absolutely straight and nearly level. It would be easy to measure off a base line four or five miles long, and arrive at a good measure of the elevation of the mountain; this might be still further improved by simultaneous angles observed from the mountain and the station. Such a measurement would depend on the elevation of the rail, of course, but this I think can be checked up. A survey has been run from this point to Mojave on the line of the Southern Pacific near Los Angeles. If the results of this latter survey could be obtained, we would know better how much reliance to put on the figures 3658. It has long been a desire of mine to make this triangulation, for the angle of elevation is over  $6^{\circ}$  and the distance 15 miles only. But I could not put very much faith on the levels over 550 miles of such rough country.

Under date of January 16, 1904, the Director of the United States Geological Survey, says:

Regarding the relative elevation of the railway station near Lone Pine, Cal., and the barometric station in that town occupied by Professor Langley, the only information that I have been able to get is to the effect that the difference in elevation is slight, probably not exceeding 10 feet, the site of the town being the higher.

More to the purpose, however, is the fact that this office has run a line of levels from the sea through the San Joaquin Valley, and up the south fork of the Kaweah River to Farewell Gap, thence connecting by vertical angles with the summit of Mount Whitney obtaining, as a result, 14,434 feet. I do not consider this result as conclusive, inasmuch as the last link in the chain consists of a single vertical angle at a distance of 34 miles.

#### METEOROLOGY IN THE UNIVERSITIES AND NORMAL SCHOOLS.

We are pleased to note that the State University of Iowa, in its calendar for May, 1903, announces, on page 171, a course of lectures on meteorology, twice a week through one semester, by Prof. A. A. Veblen, the professor and head of the department of physics. In addition to this course, which is open to both undergraduates and graduates in the department of physics, the university requires for admission the general knowledge of meteorology contained in works on physical geography mentioned on pages 80-81 of the calendar, many of which have already been noticed in the MONTHLY WEATHER REVIEW. This is one of the few universities in the world that recognizes meteorology as a part of physics rather than of geography. Corresponding with this classification we understand that the lectures at Iowa City cover the applications of thermodynamics, hydrodynamics, and physics in general to the problems of the atmosphere, thus laying a solid foundation for the future progress of this science.

Prof. R. D. Calkins, Superintendent of the Department of Geology in the Central State Normal School, Mount Pleasant, Mich., states that—

Our students are all preparing to teach in the schools of Michigan. Various phases of the subject of geography are presented to all my classes. In all courses I put a special emphasis upon the weather and

weather changes, which we follow from day to day by observation and the use of the daily weather map. In my course in meteorology we use Davis as a text-book, which is supplemented by Hann and other references, together with lectures and such explanations as are needed. Now that we have the apparatus, we expect to keep up a systematic record of weather changes. From the data thus supplied blank maps are filled out and completed. Especial emphasis is laid upon the climate of different regions, a subject which is treated of in the course in geography, following the course in meteorology. The MONTHLY WEATHER REVIEW is used daily for reference.

As many libraries, high schools, colleges, and universities, as well as individuals engaged in teaching meteorology, desire to obtain Bartholomew's Atlas of Meteorology, which is in itself a library of information, we take pleasure in communicating the information contained in a letter just received from the American agents:

The Atlas is published at \$17.50 net. If any copies are desired for educational institutions or for free public libraries, we can allow a discount of 25 per cent from this price, that being the duty paid to the Government. When the book is to be used in an institution of this kind, all that is necessary is to make an affidavit that it is to be used for educational purposes.

As the atlas weighs a little over 9 pounds, the purchaser can easily estimate the cost of carriage from Philadelphia. In general it can be sent by express cheaper than by mail.

#### OSCILLATIONS OF TEMPERATURE AT ANY ALTITUDE.

A correspondent recently asked what is known as to the variation of temperature at considerable altitudes above the earth's surface. D. Arthur Berson, the well-known aeronaut, suggested in 1894 that the variation in temperature at any altitude is connected with the variation at the earth's surface by a simple exponential formula, where  $e$  is the basis of natural logarithms and  $h$  is the altitude in meters;

$$T_h = T_0 e^{-\frac{h}{10000}}$$

According to this, if the variation whether diurnal or accidental, is  $1^\circ$  at the earth's surface its amount at other altitudes will be as in the accompanying table:

Altitude.	Variation.	Altitude.	Variation.
<i>Meters.</i>	<i>°</i>	<i>Meters.</i>	<i>°</i>
0	1.000	1500	0.223
500	0.607	1600	0.202
600	0.549	1700	0.183
700	0.497	1800	0.165
800	0.449	1900	0.150
900	0.407	2000	0.135
1000	0.368	2250	0.105
1100	0.333	2500	0.082
1200	0.301	3000	0.050
1300	0.272	4000	0.018
1400	0.247	5000	0.007

In his report on the results of recent aeronautic work,<sup>1</sup> Dr. Berson remarks that the formula seems still to hold good but will of course need some slight revision when we have collected a large number of observations at great altitudes.

#### A WATERSPOUT.

Dr. H. A. Alford of Dominica, W. I., under date of August 25, on the steamship *Fontabelle*, communicates the following:

On the 20th instant, at 7:30 a. m., a very large waterspout, from 600 to 700 feet in diameter at the base, was seen ahead of this ship in latitude  $38^\circ 26'$  north and longitude  $72^\circ 55'$  west as kindly determined for me by Captain Mann, and I forward the particulars to you.

The captain has kindly allowed me to take the following extract from his log, which may be useful:

"August 20, strong south-southeast wind to end of day; steamed south one-half east. August 21, strong south-southwest wind and heavy head sea for whole twenty-four hours; shipping heavy water on deck; steering south; midnight, wind moderated and sea went down."

The following were the positions of the ship at noon on August 20 and

21: August 20, latitude  $37^\circ 44'$  north; longitude  $72^\circ 40'$  west. August 21, latitude  $34^\circ 26'$  north; longitude  $70^\circ 56'$  west.

I shall be obliged if you will inform me whether the stormy weather we experienced was that of the northern segment of a West Indian hurricane.

The weather map of 8 a. m., August 20, shows a trough of low pressure extending along the entire Atlantic coast, with the lowest barometer in the Maritime Provinces, and a subordinate low area central about New York City. The waterspout observed by Dr. Alford was therefore nearly due southeast of this latter storm center, and consequently in the quadrant where both tornadoes and waterspouts are most frequently observed. It was to this slowly eastward moving area of low pressure, and not to a West Indian hurricane, that the winds and sea experienced by the *Fontabelle* may be ascribed.—Ed.

#### ILLNESS OF MR. CURTIS J. LYONS.

Mr. R. C. Lydecker, under date of July 31, announces that, on account of the serious illness of Mr. Curtis J. Lyons, Territorial Meteorologist for Hawaii, he has been appointed by the Surveyor General as Acting Territorial Meteorologist. Having been a member of Mr. Lyons's family for some years, deeply interested in meteorology, and frequently assisting him in his work, the duties of the office are not new to Mr. Lydecker, who will undoubtedly carry on the work according to the same principles that have guided Mr. Lyons.

#### LIGHTNING PHENOMENON.

The following from the Cleveland Leader is kindly communicated by Father Odenbach, of Ignatius College, in that city:

Geneva, Ohio, November 19.—A phenomenon was seen in Unionville between 5 and 6 o'clock yesterday afternoon, during the snowstorm. There was a flash of lightning, seeming to emanate from the snow itself, and illuminating surrounding buildings and objects quite brightly. It consisted of two almost simultaneous flashes, one stronger than the other, and of a purple and milky-white color. They were followed by a faint roll of thunder like the approach of a distant storm. Such a freak of nature was known to occur during a snowstorm twenty years or more ago.

#### THE BAROMETRIC DISTURBANCE IN THE DANISH WEST INDIES, NOVEMBER 22-29, 1903.

We are indebted to Mr. John T. Quinn, F. R. G. S. and Royal Gold Medalist, Inspector of Schools in the Danish West Indies, for an early copy of the *St. Croix Avis*, published at Christiansted, December 5, 1903, from which we print the following article written by him:

The following account of this great movement, which occupied just one week, namely, from Sunday the 22d to Sunday the 29th of November, is mainly based on notes taken in St. Thomas.

The first hint of the approach of the disturbance was given by the high clouds (cirrus, etc.) on the morning of Sunday the 22d. High clouds (cirro-stratus) had been noted on the 19th and 20th as coming from west-northwest, the wind and lower clouds at the same time moving from northeast. On the 21st, at 7:30 a. m., many narrow bands of cirrus were seen, radiating from the south and curving toward the east. Much cirro-stratus also appeared, and both kinds of clouds were moving from the west; but on Sunday morning there was a remarkable display of high clouds, in regard to which the following note was made at the time: "9:15 a. m. A very beautiful band of cirrus and cirro-stratus, stretching about east and west and nearly overhead, the shaft having many faint feathery radiations all looking east; the shaft pointing west and the band a little spreading, plume-like, toward the east. Could not separate the motion of the cirrus and cirro-stratus, the whole appearing to move together from west by south. The sky showed many cirrus shafts having same direction, and some independent patches of cirro-stratus. In one large and very fine patch, with waved silky fibers springing from it in several directions, there was a quantity of cirro-cumulus, but all (cirrus, cirro-stratus, and cirro-cumulus) seemed to be moving together in the same plane."

Cirrus clouds are known among sailors as "mare's tails," and it is well known that an abundance of such clouds is believed by them to in-

<sup>1</sup> Wissenschaftliche Luftfahrten, Vol. III, p. 120, 1900.